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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/035,766	12/26/2001	Randolph D. Schueller	065095.0125	3820
25920	7590	03/08/2005	EXAMINER	
MARTINE PENILLA & GENCARELLA, LLP 710 LAKEWAY DRIVE SUITE 200 SUNNYVALE, CA 94085			GUHARAY, KARABI	
			ART UNIT	PAPER NUMBER
			2879	

DATE MAILED: 03/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/035,766

Applicant(s)

SCHUELLER ET AL.

Examiner

Karabi Guharay

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 December 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Amendment, filed on 12/26/2004 has been considered and entered. Claims 15-24 are cancelled. The list of claims, filed on 12/26/04 does not contain claim 9. However, applicant does not mention cancellation of claim 9, so prosecution of claim 9 has been presented below, however, correction is required.

Amendments of specification overcome the objection to the disclosure. Amendment of claims 4 & 12 overcome the objection to the specification and the drawings.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Gray et al. (US 4964946).

Regarding claim 1, Gray et al. disclose an apparatus for emitting electrons (field emitting array, see Fig 1G, and lines 7-9 of column 1) comprising a contiguous emission layer (10) incorporating a plurality of protruding emitter tips (11, though in figures one emitter tip is shown it is a set of emitters are formed, see lines 9-11 of column 2) emission layer (10) is formed from a mold (though not mentioned in this patent however mentioned in US 4307507, lines 33-47 of column 1, which is incorporated by reference) wherein the emission layer and the plurality of emitter tips are composed of a material having electron emitting properties (lines 11-18 of column 2); a selected portion of a first

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dielectric layer (layer 12, lines 22-25 of column 2) contacting the emission layer (10) between the emitter tips, each emitter tip being contiguous with an opening in the first dielectric layer 12 (see Fig 1G), a dielectric support layer (14) contacting the selected portion of the first dielectric layer, the opening in the first dielectric layer being contiguous with an opening in the dielectric support layer (14) the opening in the dielectric support layer having a size (lines 28-32 of column 2); a gate layer (conductive layer 16) contacting the dielectric support layer (14) the opening in the dielectric support layer being contiguous with an opening in the gate layer, wherein the size of the opening in the gate layer is equal to the size of the opening in the dielectric support layer (see Fig 1G).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gray et al. (US 4964946).

Regarding claim 2, Gray et al. disclose that the first dielectric layer is comprised of silicon dioxide or silicon nitride (lines 22-23 of column 2) and the dielectric support layer is composed of silicon dioxide (lines 31-33 of column 2).

Further, it is noted that applicant's specific choice of silicon dioxide for first dielectric layer and silicon nitride for dielectric support layer does not solve any of the

stated problems or yield any unexpected result that is not within the scope of the teachings applied. Therefore it is considered to be a matter of choice, which a person of ordinary skill in the art would have found obvious to select one of the well-known dielectrics such as silicon dioxide or silicon nitride for the dielectric support layer.

Claims 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gray et al. as applied to claim 1 above, and further in view of Levine et al. (US 5589728).

Regarding claims 3-4, Seko discloses all the limitations of claims 3-4, except for each cavity surrounding a group of emitters, instead Gray et al. disclose a single emitter in each cavity and at least a support pillar being disposed between substrate and the support layer.

However, Levine discloses a group of emitters (14 of Fig 11F) provided in a cavity (141) and a support pillar (post 143 of Fig 11F, lines 65 of column 6- line18 of column 7) in order to reduce the cathode to gate capacitance by reducing dielectric material between cathode and grid (lines 34-48 of column 3).

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a group of field emitter tips in a cavity as disclosed by Levine in the device of Gray et al. in order to have reduced gate to cathode capacitance.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gray et al. as applied to claim 1 above, and further in view of Tjaden et al. (US5804910).

Regarding claim 5, Seko teaches all the limitations of claim 5 except for the limitation of emitter tip is carbon based.

However, Tjaden et al. discloses a field emission cathode (13 of Fig 1), which is carbon-based. Tjaden et al. further disclose that carbon based emitter tips provide major advantage of hardness as well as stability of the emitter (see lines 66 of column 3-lines 8 of column 4).

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have a carbon based emitter in the device of Seko, since carbon based field emitters are durable and stable and also have low work function.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gray et al. as applied to claim 1 above, and further in view of Seko et al. (US 6075315).

Regarding claim 6, Gray et al. meet all the limitations of claim 6, except for a cover layer in contact with the gate layer.

However, Seko et al. disclose a cover layer (81 of Fig 11A) contacting the gate layer (4, lines 15-17 of column 11) providing protection of the gate layer.

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a cover layer contacting the gate layer in order to protect the gate layer.

Claims 7-10, & 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gray et al. (US 4964946) in view of Seko et al. (US 6075315).

Regarding claim 7, Gray et al. disclose Gray et al. disclose an apparatus for emitting electrons (field emitting array, see Fig 1G, and lines 7-9 of column 1)

Regarding claim 7, Gray et al. disclose Gray et al. disclose an apparatus for emitting electrons (field emitting array, see Fig 1G, and lines 7-9 of column 1) comprising a contiguous emission layer (10) incorporating a plurality of protruding emitter tips (11, though in figures one emitter tip is shown it is a set of emitters are formed, see lines 9-11 of column 2) emission layer (10) is formed from a mold (though not mentioned in this patent however mentioned in US 4307507, lines 33-47 of column 1, which is incorporated by reference) wherein the emission layer and the plurality of emitter tips are composed of a material having electron emitting properties (lines 11-18 of column 2); a selected portion of a first etch layer (layer 12, lines 22-25 of column 2) contacting the emission layer (10) between the emitter tips, each emitter tip being contiguous with an opening in the first dielectric layer 12 (see Fig 1G).

But Gray et al. fails to teach a first intermediate dielectric layer contacting the selected portion of the etch layer, the opening in the first etch layer being contiguous with an opening in the first intermediate dielectric layer and a selected portion of a second intermediate dielectric layer contacting the first intermediate dielectric layer, the opening in the first intermediate dielectric layer being contiguous with an opening in the second intermediate dielectric layer.

However, Seko et al. disclose a field emission device having, a first intermediate dielectric layer (12) contacting the selected portion of the first etch layer, the opening in the first etch layer (11) being contiguous with an opening in the first intermediate dielectric layer (12), a selected portion of a second intermediate dielectric layer (13-15) contacting the first intermediate dielectric layer (12), the opening in the first

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intermediate dielectric support layer being contiguous with an opening in the second intermediate dielectric layer, a dielectric support layer (16, of Fig 6A) contacting the selected portion of the second intermediate dielectric layer (13-15), the opening in the second intermediate dielectric layer being contiguous with an opening in the dielectric support layer (16), a gate layer (4) contacting the dielectric support layer (16), the opening in the dielectric support layer being contiguous with an opening in the gate layer.

Further Seko et al. teach that using such different stacked insulating layers provide an excellent insulating characteristics and in case of one dielectric breakdown there is no damage to functions of other elements (lines 66 of column 3-36 of column 4).

Thus it would have been obvious to one having ordinary skill in the art the time the invention was made to use a first intermediate dielectric layer and a second intermediate dielectric layer between the etch layer and the dielectric support layer of Gray et al. since such stacks of dielectric layer will provide excellent insulation characteristics.

Regarding claim 8, Gray et al. disclose that the first etching layer 12 is a metal layer, however does not specifically disclose aluminum, however aluminum is a suitable etch material, thus it would have been obvious to one having ordinary skill in the art at the time the invention was made to use aluminum metal for the etch stop layer 12, since selection of known material for the intended purpose is within the skill of art.

Regarding claim 9, Seko discloses that the first intermediate dielectric layer (12) is composed of silicon nitride (lines 5-7 of column 9). The same reason for combining art as in claim 7 applies.

Regarding claim 10, Seko discloses that the support layer is composed of silicon nitride (lines 7-10 of column 9). The same reason for combining art as in claim 7 applies.

Regarding claim 13, Seko discloses a cover dielectric layer (81 of Fig 11A) contacting the gate layer (4, lines 15-17 of column 11). The same reason for combining art as in claim 7 applies.

Claims 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gray et al. & Seko et al. as applied to claim 7 above, and further in view of Levine et al. (US 5589728).

Regarding claims 11-12, combined structure of Gray and Seko et al. meets all the limitations of claims 11-12, except for each cavity surrounding a group of emitters, instead Gray et al. disclose a single emitter in each cavity and at least a support pillar being disposed between substrate and the support layer.

However, Levine discloses a group of emitters (14 of Fig 11F) provided in a cavity (141) and a support pillar (post 143 of Fig 11F, lines 65 of column 6- line18 of column 7) in order to reduce the cathode to gate capacitance by reducing dielectric material between cathode and grid (lines 34-48 of column 3).

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a group of field emitter tips in a cavity as

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disclosed by Levine in the combined structure of Gray et al. & Seko et al. in order to have reduced gate to cathode capacitance.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gray et al. & Seko et al. as applied to claim 7 above, and further in view of Tjaden et al. (US5804910).

Regarding claim 14, Gray & Seko et al. teach all the limitations of claim 14 except for the limitation of emitter tip is carbon based.

However, Tjaden et al. discloses a field emission cathode (13 of Fig 1), which is carbon-based. Tjaden et al. further disclose that carbon based emitter tips provide major advantage of hardness as well as stability of the emitter (see lines 66 of column 3-lines 8 of column 4).

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have a carbon based emitter in the device of Seko, since carbon based field emitters are durable and stable and also have low work function.

Other Prior Art Cited

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure :Cathey , Jr. et al. (US 6020683).

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karabi Guharay whose telephone number is (571) 272-2452. The examiner can normally be reached on Monday-Friday 8:30 am - 5:00 pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (571) 272-2457. The fax phone number for the organization is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Karabi Guharay
Karabi Guharay
Patent Examiner
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